

TITLE: Assessing impacts of an invasive *Myoporum* thrips (*Klambothrips myopori*) infestation in Hawaii: Distribution, Rate of Spread, and Impact on Forest Resources

LOCATION: State of Hawaii (Hawaii, Maui, Molokai, Lanai, Oahu, Kauai)

DATE: September 2009

DURATION: 3-year project

FUNDING SOURCE: Base Plan

PROJECT LEADERS:

Robert Hauff (Forest Health Coordinator) and Cynthia King (Entomologist)
Dept. of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW), 1151
Punchbowl Ave, Kalanimoku Building Rm. 325, Honolulu, HI 96813

COOPERATORS:

Darcy Oishi, Hawaii Dept. of Agriculture, Plant Pest Control (Biological Control Branch Chief)
Patrick Chee, Hawaii Invasive Species Council (Coordinator)
Anne Marie LaRosa, Institute of Pacific Islands Forestry, USDA-FS (Forest Health Coordinator)

FHP SPONSOR/CONTACT:

Sheri Smith, USDA Forest Service, Forest Health Protection, Susanville, CA, ssmith@fs.fed.us

PROJECT OBJECTIVES:

1. Initiate an evaluation monitoring survey program to define the current distribution of *Myoporum* thrips (*Klambothrips myopori*) infestation, and map the area of infestation on Hawaii Island.
2. Determine impact of *Myoporum* thrips across a variety of ecosystems/climates and along elevational gradients.
3. Monitor *Myoporum* thrips density and distribution over time in infested areas, and measure rates of spread.
4. Evaluate the potential for management and control of *Myoporum* thrips (feasibility of chemical and biological controls), based on distribution, densities and rates of spread.
5. Help train field surveyors and land managers (state/federal/private) to detect *Myoporum* thrips and identify infestations on all of the main Hawaiian Islands.

JUSTIFICATION:

a. **Linkage** to FHM Detection Monitoring- Detections of new forest pests through ground surveys by state, federal, and private land and resource management agencies, and/or as a result of reports from the general public, are the most common Forest Health Monitoring early detection method used in the State of Hawaii. The initial infestation of naio (*Myoporum sandwicense*) by *Myoporum* thrips (*Klambothrips myopori*) was reported to the Hawaii Dept. of Agriculture (HDOA) in March 2009 by a North Kona resort groundskeeper. In collaboration with DOFAW and the Big Island Invasive Species Committee, HDOA conducted initial delimiting surveys to assess the distribution, and determine whether *Myoporum* thrips should be the target of eradication efforts. HDOA will continue to survey nurseries for this pest throughout the state with assistance from the USDA APHIS CAPS program.

b. **Significance** in terms of the geographic scale- The extent of the *Myoporum* thrips infestation is currently unknown on Big Island, but populations continue to be detected on the west and north side of the island. Given the frequency of inter-island transport of goods and people, and the precedence of pest range expansions, the species will likely spread to other Hawaiian Islands. Consequently, the scope of this project impacts the health of native forests, and associated biota, on all of the Hawaiian Islands.

c. **Biological impact-** *Myoporum* thrips have been documented to cause high levels of mortality in ornamental *Myoporum* species used for landscaping residential and freeway margins in California (Mound and Morris 2007). In Hawaii, there is no reason to expect a different outcome in terms of plant mortality, and the potential ecological impacts are much greater. *Myoporum sandwicense* (naio) is an

integral component of native Hawaiian ecosystems. While it is most dominant in dry forests, and lowland and upland shrublands, the species also populates mesic and wet forest habitats. Naio is distributed across all of the main Hawaiian Islands, and is present from sea-level to upwards of 3000m. The species exhibits two forms (upright tree and prostrate shrub) as a function of the variable abiotic factors to which it has adapted. The loss of this species would be a significant biological and structural loss to native forest habitats. Upland dry forests are dominated by two tree species (Naio and mamane, *Sophora chrysophylla*), and the loss of naio would forever change forest composition, and forest resources available to native Hawaiian biota residing therein. The loss of naio would be particularly biologically detrimental where the plant comprises a key component of Critical Habitat for the palila (*Loxioides bailleui*), a federally endangered species of honeycreeper on Maunakea, and, at South Point, where the naio population is morphologically unique, and may constitute a new sub-species or species.

d. **Scientific Basis/Feasibility** – Thrips survey methods have been developed for use in a variety of agricultural and horticultural landscapes (Worner and Chapman 2000; den Belder et al. 2002). We will implement standardized survey protocols to determine *Myoporum* thrips presence, distribution and densities. We will collaborate with the island-based Invasive Species Committees and the HDOA, to implement extensive surveys for *Myoporum* thrips in the region. These organizations have trained staff on the ground conducting surveys for many invasive species, and can easily integrate *Myoporum* thrips surveys into current field protocols. Many of our collaborators have already prioritized *Myoporum* thrips as a target for field surveys and control measures, and are committed to participating in this project.

e. **Priority Issues** addressed from Request for Proposals – We will collect data on **tree mortality** and changes to **crown structure**, as a result of *Myoporum* thrips infestations. The effects of **forest cover fragmentation** will also be evaluated if or when the pest moves into habitats which support the endangered Palila.

References

- den Belder, E., J. Elderson, W.J. van den Brink, G. Schelling. 2002. Effect of woodlots on thrips density in leek fields: a landscape analysis. *Agriculture, Ecosystems and Environment*. 91 : 139-145.
- Hoddle, M. Updated 2009. *Myoporum* thrips. Center for Invasive Species Research, University of California, Riverside. http://cistr.ucr.edu/myoporum_thrips.html
- Mound, L.A. & Morris, D.C. 2007. A new pest of *Myoporum* cultivars in California, in a new genus of leaf-galling Australian Phlaeothripidae (Thysanoptera). *Zootaxa*. 1495 : 33–45.
- Worner, S.P. and R.B. Chapman. 2000. Analysis of binomial sampling data for estimating thrips densities on ornamental plants. *Journal of Horticultural Insects*. 53 : 190-193.

DESCRIPTION:

a. **Background:** The species description for *Myoporum* thrips was only completed in 2007 (Mound and Morris), and while the thrips was likely introduced to California from Australia, the exact region of origin of the species remains unknown. Prior to the 2009 infestation in Hawaii, entomologists from California and Hawaii had suggested that native Hawaiian naio was at equal or greater risk of infestation by *Myoporum* thrips. Unfortunately, the predictions appear to be correct, and the damage caused by the thrips will likely result in direct mortality to infested naio.

b. **Methods:** Ground crews will conduct comprehensive delimiting surveys of naio populations to map the current distribution of *Myoporum* thrips on Hawaii Island, as well as train those conducting detection monitoring surveys on Maui, Molokai, Lanai, Oahu, and Kauai. Due to the distinct galling damage with occurs as a result of *Myoporum* thrips feeding, as well as the size and color of the individual *Myoporum* thrips, field crews will be able to easily identify infested naio. Specimens and infested material will also be collected for identification by DOFAW or HDOA entomologists. Monitoring sites will be established every 1000m along an elevational gradient on Hawaii Island to measure dispersal and *Myoporum* thrips impact on forest composition, canopy cover, crown structure and branch growth. Field monitoring sites will be established in habitats where the *Myoporum* thrips infestation is ongoing, and in control sites where the species has not yet become established; monitoring will be conducted on a monthly basis. Surveyors will also observe whether natural enemies are present in the system, and whether these species are predating or parasitizing the thrips. The data obtained (density, distribution, rates of spread, and presence of natural enemies) will provide the foundation for informed management

decisions regarding control of *Myoporum* thrips. Workshops for the survey and identification of *Myoporum* thrips will be organized and travel funds will be provided to facilitate attendance. Outreach materials will be developed and distributed to surveyors and the public.

c. Products: Data collected from *Myoporum* thrips surveys will be summarized and reported by DOFAW, and made available for use by state, private or federal land managers. Maps of *Myoporum* thrips distribution will be created, and rates of spread will be calculated. Whether chemical, biological, cultural, or no controls, are ultimately implemented, sound management decisions will be derived directly from field data. A paper will also be submitted for publication to a relevant scientific journal. The training of surveyors located on Kauai, Oahu, Molokai and Maui will increase the likelihood of early detection.

d. Schedule of Activities:

- In year 1 we will fund 1 full-time surveyor, or 2 part-time surveyors to conduct fieldwork (initiate surveys and establish monitoring plots) beginning in the summer months. Fieldwork will continue throughout the fall, winter, and spring, and mapping will be completed according to the progression of field surveys. Monitoring plot data collections will occur on a monthly/quarterly basis. Training for detection and identification of *Myoporum* thrips will be organized in the fall.
- In year 2 we will continue with delimiting surveys [if necessary], create and/or update *Myoporum* thrips distribution maps, collect data from established monitoring plots, and continue to organize educational training sessions.
- In year 3 we will continue monitoring and data collections, and focus on developing maps and calculations of rates of spread of the species. All data analysis, map products and reports will be completed by the end of year 3. A project representative will attend the Annual Forest Service FHM meeting to present the project results.

COSTS:

YEAR 1	ITEM	REQUESTED FHM EM \$	OTHER SOURCE \$	SOURCE
Administration	Salary*	39,200.00	38,706.14	DOFAW
	Overhead	1281.00		
	Travel	2000.00		
Procurements	Contracting			
	Equipment	1000.00		
	Supplies	500.00		
Indirect				
TOTAL: Year 1		43,981.00	38,706.14	
YEAR 2				
Administration	Salary*	39,200.00	38,706.14	DOFAW
	Overhead	1236.00		
	Travel	1000.00		
Procurements	Contracting			
	Equipment	500.00		
	Supplies	500.00		
Indirect				
TOTAL: Year 2		42,436.00	38,706.14	
YEAR 3				
Administration	Salary*	39,200.00	38,706.14	DOFAW
	Overhead	1230.00		
	Travel	1500.00		
Procurements	Contracting			
	Equipment			
	Supplies	300.00		
Indirect				
TOTAL: Year 3		42,230.00	38,706.14	
PROJECT TOTAL		128,647.00	116,118.40	

*Salary request covers 1 full-time or 2 part-time surveyors, or one full time graduate student.